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Poly-use of cannabis and other substances among juvenile-justice involved youth: Variations in psychological and substance-related problems by typology

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Abstract

Background: Adolescent cannabis use is associated with increased risk for psychological problems, with evidence for more severe problems among youth who use cannabis in combination with other substances (i.e., polysubstance use). Juvenile offenders engage in both cannabis use and polysubstance use at higher rates than the general adolescent population. Yet, limited research has examined the relationship between cannabis poly-use (e.g., cannabis and alcohol use) and functional or psychological problems among juvenile offenders.

Objectives: The current study addresses this gap by examining the association of polysubstance use of cannabis compared to cannabis only use with cognitive functioning, psychological distress, and substance-related problems among juvenile detainees.

Methods: Participants were 238 detained youth ages 12–18 (80.4% male, 77.3% non-White) who completed assessments of substance use, intellectual functioning, psychological symptoms, and substance-related problems. Youth were also assessed by a clinical psychologist for substance use disorder.

Results: Four cannabis-use typologies were identified; cannabis and alcohol use was the largest class, followed by cannabis only use, cannabis, alcohol and other drug use, then cannabis and other drug use. Polysubstance use was associated with lower scores on measures of intellectual functioning, more externalizing and internalizing symptomology, and more substance-related problems relative to cannabis only use. However, the relationship between polysubstance use and problems varied by typology.

Conclusions: Findings suggest that justice-involved youth engaged in polysubstance use may be at greater need for concurrent academic, affective, and behavioral support in their rehabilitation and transition back to the community.

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Keywords

Cannabis; Polysubstance use; Juvenile justice; Adolescent; Substance use; Youth

Introduction

Cannabis is the most commonly-used illicit drug among U.S. adolescents, with 30% of school-aged adolescents reporting any history of cannabis use in 2015 (1). Yet among juvenile offenders, rates of cannabis use are higher than among adolescents in general population studies, with lifetime rates ranging from 54% to 92% among justice-involved samples (2, 3). Disproportionate rates of cannabis use among juvenile offenders are concerning, as cannabis use during adolescence is associated with multiple functional and mental health problems, including poor academic achievement (4), delinquency (5), cognitive impairment (6, 7), psychological distress (8), and the development of substance use disorders (SUDs) (9). SUDs and other mental health problems associated with cannabis use are related to increased risk for recidivism among juvenile detainees (10, 11), suggesting that those who use cannabis require screening and intervention while justice-involved to facilitate treatment and prevent re-offending.

The high prevalence of cannabis use among juvenile offenders is not only concerning due to its association with mental health problems, but also due to its strong association with other substances among adolescents (12, 13). Thus, a body of literature has emerged examining adolescent polysubstance use, defined as reporting use of more than one substance within a specified time frame (14), ranging from same day to lifetime (15, 16). Adolescent use of cannabis and other substances is common. For example, within the literature on adolescent polysubstance use, there is evidence that youth are unlikely to use cannabis but not alcohol (12, 17), with several recent studies noting that the polysubstance use of cannabis and alcohol comprises up to 34% of nationally-representative samples of adolescents (18–20). Less research has examined rates of polysubstance use of cannabis and other substance among juvenile offenders, but data suggests that the prevalence may be much higher among this population. For example, among a sample of male detainees, Racz and colleagues (3) found that 92% of detainees used cannabis, 85% engaged in polysubstance use of cannabis and alcohol, 93% engaged in any type of polysubstance use, with a mean of substances three substances. These high rates of polysubstance use among juvenile offenders are likely to contribute to their high rates of SUD, as polysubstance use disorder is common among this population, with one study finding that 21% of offenders met criteria for both cannabis use disorder and another SUD (10).

Due to the prevalence of co-occurring alcohol and cannabis use among adolescents, research has begun to examine associated problems, with findings indicating that this type of use is associated with increased risk for psychological distress (21), cognitive impairments (7), and SUDs relative to use of a single substance among general population adolescents (17, 19). These relationships between substance use and mental health problems have been supported by several models, including animal models demonstrating the deleterious effects of cannabis on adolescent learning (22), and theories such as the dual pathway deviance-

proneness models, which say that hazardous substance use is linked to behavioral disinhibition/deviance (23) and internalizing problems (24). However, little is known about the relationship between polysubstance use of cannabis and other substances and psychological comorbidities among juvenile offenders. One study among juvenile offenders found that those who used drugs and alcohol were more likely to have diagnoses of attention deficit disorder and an aggressive sub-type of conduct disorder than those who did not use substances (25), suggesting that the association between polysubstance use and psychological problems may also hold among this high-risk population, although the study did not explicitly examine cannabis and alcohol polysubstance use.

However, as research examining the psychological problems related to polysubstance use is fairly nascent, few studies have compared polysubstance use to single substance use, to examine whether these models hold as well for polysubstance use. Moreover, to our knowledge, no study has examined the differential effect of polysubstance use versus single substance use on health problems among juvenile offenders who use substances. As juvenile offenders also engage in disproportionately high rates of polysubstance use (3), such work would help identify targets for intervention that may facilitate these adolescents' rehabilitation and transition back to the community. Given the high rates of cannabis use among juvenile offenders, the current study will examine problems associated with polysubstance use among those who use cannabis.

Specifically, we will examine four *substance-use typologies*, or types of substances being used in a discrete period: cannabis only, cannabis + alcohol, cannabis + other drugs, or cannabis + alcohol + other drugs. Given that common problems of adolescent cannabis use (26) and polysubstance include cognitive impairment, psychological symptoms, and addiction (7, 19, 21), the current study will focus on these problems. Thus, extending upon findings from general adolescent populations, we hypothesize that among our sample of detained youth, those who engage in polysubstance use will report poorer intellectual functioning, internalizing symptoms, and externalizing symptoms than those who only use cannabis. We also hypothesize that youth who engage in polysubstance use will be more likely to report substance-related problems, including the presence of a SUD, than those who use cannabis only after controlling for related risk factors (i.e., substance use attitudes and family/peer risk).

Methods

Participants

Participants in the present sample were drawn from 287 detained youth referred for psychological assessment by the juvenile court in a large Mid-western U.S. city from October 2010 to July 2016. Assessments were completed by representatives from a local university who were contracted by the juvenile court. Youth provided voluntary consent to undergo psychological testing and assessment by the university on behalf of the juvenile court; youth also consented to the university managing the collected data and sharing it with the juvenile courts. We then received Institutional Review Board approval to code and de-identify this archival assessment data to be used for research purposes. Participants were ages 12–18 and reported past-year use of cannabis prior to detention, as those who did not

report past-year cannabis use prior to detention were excluded. Of the 287 youth assessed, 271 provided data regarding substance use; 21 of these youth reported abstinence in the past year and 12 reported substance use, but not cannabis use (alcohol only use [n = 9], alcohol and other illicit drug use [n = 2], and cocaine only use [n=1]). Thus, the prevalence of cannabis use among the valid substance use data was 87.8%. Most participants (N = 238) were male (81.1%) and non-White (75.6%; 67.6% African American/Black, 3.8% Hispanic/Latino, and 4.2% multiracial). The age of participants ranged from 12–18 (M =15.51).

Measures

Demographics and control variables.—Youth reported their age, gender, race, school enrollment status, and presence of an individualized education plan (IEP) indicating special education needs.

Cannabis use typology.—Past-year cannabis use and other substance use prior to detention was assessed by a clinician during the psychological assessment and recorded in the assessment report with dichotomous responses. Based on the assessment report, youth were then categorized in to three classes of substance use typologies based on past year substance use. Cannabis only (*CO*) users were defined as those youth reporting only using cannabis over the past year (n = 73), cannabis and alcohol (*C+A*) users were defined as those youth reporting using both cannabis and alcohol over the past year (n = 103), cannabis and other drug (*C+O*) users were those reporting using cannabis and at least one other drug use (e.g., spice, non-prescribed medication, ecstasy, methamphetamines; n = 13), and cannabis, alcohol, and other drug (*C+A+O*) users were those reporting cannabis, alcohol, and at least one other drug (n = 49).

Intellectual functioning.—Intellectual functioning was assessed using the Wechsler Intelligence Scale for Children (WISC-IV) (27). The WISC-IV is a clinician administered measure of intellectual functioning for youth ages 6–18 years of age used to compute a full-scale intelligence quotient (FSIQ) and four composite scores: Verbal comprehension index (VCI), perceptual reasoning index (PRI), working memory index (WMI), and processing speed index (PSI). Index scores are computed and converted to T-scores based on a normative sample, with corresponding percentile rankings. Mean score for the Index scores is 100 (SD = 15). Composite scores have shown excellent reliability (0.88 to 0.97), test-retest reliability (0.86–0.93), and inter-rater reliability (0.95–0.98) (28).

Internalizing and externalizing symptomology.—The Youth Self-Report (YSR) (28) internalizing and externalizing broad-band scales were used to assess symptoms related to *internalizing* problems (e.g., withdrawn, depressed, anxious, and somatic complaints) and *externalizing* problems (e.g., rule breaking, attention difficulties, and aggression). Youth rate themselves on various behavioral and emotional problems and competencies on a scale from 0 (not true) to 2 (very often or often true). Scale scores are converted to T-scores with corresponding percentile rankings. T-scores < 65 on YSR scales are considered to fall in the “normal” range and increases in T-scores over 65 correspond with elevations in symptom severity. The reliability and validity of these scales are well documented (28, 29) and the YSR has been validated for use in samples of juvenile justice-involved youth (30).

Substance-related problems.—Hazardous substance use was assessed through the Adolescent Substance Use Subtle Screening Inventory (SASSI-A2) (31), a questionnaire used to help determine if further assessment and/or treatment are needed for a SUD in youth. The SASSI-A2 Face Valid Other Drugs (FVOD) subscale was used to evaluate past year illicit drug use and related problems (e.g., "Spent your spare time in buying, selling, taking, or talking about drugs" "Gotten into trouble in school, at home, on the job, or with the police because of your drug use;" Miller et al., 2001). Response options range from 0 (never) to 3 (repeatedly). Raw scores are converted to T-scores, with scores > 57 (males) and > 60 (females) indicative of a high probability of a SUD (32).

As part of the court-ordered assessment, youth were also assessed for mental health diagnoses in a clinical interview, including diagnosis of a SUD. During the assessment, a licensed clinical psychologist assigned SUD diagnosis to youth based on criteria outlined in the Diagnostic and Statistical Manual of Mental Disorders-5th edition (DSM-5) (33).

Substance-related covariates.: Family/friends risk for substance use and attitudes towards substance use as measured by the SASSI-A2 were included as control variables, as they are strongly related to engagement in substance use and subsequent problems (32). The SASSI-A2 family/friends risk scale assesses the extent to which a youth is part of a family or social system that fosters substance use (e.g., "I'm friends with some people that sell drugs"). Response options for each item are "true" or "false", with raw scores ranging from 0–9. T-scores > 61 (males) and > 60 (females) are indicative of a high probability of a SUD. The SASSI-A2 attitudes scale assesses youth's attitudes and beliefs towards substance use (e.g. "Most of the people my age drink or use drugs," "Drugs help people to be creative". Response options for each item are "true" or "false", with raw scores ranging from 0–10. The attitudes scale has shown excellent two-week test-retest reliability (r=.92) and good internal consistency (Cronbach's alpha=.72) (32).

Procedure

Following detention by the Juvenile Court (i.e., charged with a new offense or probation violation), youth in the present sample were referred to the university's medical school to complete a court ordered psychological assessment. Youth referred for evaluation were typically detained 30–60 days. Assessments were conducted during the detention period prior to the youth's disposition hearing (i.e., sentencing). Youth were typically referred for psychological testing when probation officers were considering a correctional facility for the youth to serve their sentence, such as a residential or prison placement or when they had suspicions of mental health or substance-related problems that might impair the youth's judgment. Youth were detained under a variety of charges, but most carried charges of delinquency unrelated to substance use (e.g., theft, criminal mischief,) or violent offenses (e.g., battery) (see Table 1). Only 28 youth (12%) in the current sample carried substance-related charges. As a significant proportion of youth (42%) were charged with more than one offense, only 9 youth in the current sample were exclusively charged with a substance-related offense.

Following referral, a licensed clinical psychologist or supervised doctoral student reported to the Juvenile Detention Center or the youth's current placement (residential facility or home detention) to complete a psychological assessment. If youth refused the assessment, it was not conducted and the court was notified. We do not have data on how many youth may have refused the assessment. After youth consented to the psychological assessment, a clinician conducted a clinical interview guided by the Youth Level of Service/Case Management Inventory (YLS/CMI) (34, 35) to assess for substance use and diagnoses of mental illness, as described above, and administered an assessment battery, which included the YSR, SASSI-A2, WISC-IV, and other measures unrelated to the present study that were used to aid diagnosis (e.g., Minnesota Multiphasic Personality Inventory-Adolescent, Child Depression Inventory, Child Behavior Checklist). The clinician composed a psychological assessment report for each youth, which was submitted to the court. Following IRB approval, two trained research assistants coded and de-identified the assessment reports for each youth. An additional 20% of the data was re-coded by a third coder; any discrepancies were reconciled before data analysis.

Data Analysis

All analyses were performed in SPSS 24.0. Preliminary analyses confirmed that all continuous variables met assumptions of normality, with one-way ANOVAs and Chi square tests used to examine whether demographic and other study variables differed by cannabis use typology using. Cannabis use typology was dummy coded with cannabis only as the reference group for all analyses. Multiple linear regression analyses were used to examine the relationship between cannabis use typology and intellectual functioning, internalizing symptoms, externalizing symptoms and substance-related problems. Analyses for intellectual functioning controlled for race, school enrollment, and IEP given consistent evidence of lower scores on IQ tests among racial/ethnic minority youth (36) the positive association between school enrollment and IQ scores (37), and the negative association between curricular modifications (such as IEPs) and IQ scores (38). Gender and age were not controlled for as WISC-IV scores are normed for gender and age. All other linear regression analyses controlled for race, gender, and age. The models examining substance-related problems and SUD also controlled for family and peer risk, and attitudes related to substance use due to their associations with adolescent substance use (39, 40). Finally, multiple logistic regression analysis was used to examine diagnosis of a SUD from age, gender, race, family/peer risk, substance use attitudes (again, due to the well-established associations of these factors with substance use) (36, 37) and cannabis use-typology. Model fit for linear regression was analyzed by examining change in adjusted R^2 values after the addition of the typology variables to the models. Fit was improved for all models except that examining PSI. Model fit for the logistic regression was analyzed using a Hosmer and Lemeshow test, which suggested good model fit ($x^2 = 10.49$, $p = .232$).

Case-wise deletion was used to account for missing data, so sample size varied by variable examined (see Table 2 for sample sizes for each variable). Most missing data is on the WISC-IV, as some youth were assessed with other instruments for intellectual functioning (e.g., Kaufman Brief Intelligence Test, Wechsler Adult Intelligence Scale). There were no differences between participants with and without data on any of the other variables of

interest (i.e., substance use and psychological problems). Demographic covariates also were not significantly associated with missing data.

Results

C+A use made up the largest cannabis use typology (43.3%), followed by CO use (30.7%), C+A+O use (20.6%), and C+O use (5.5%). There were no significant differences between cannabis-use typology based on age (F[3, 234] = 11.41, p = .068) or gender (x^2 = 2.87, p = .413, V = .11). However, significant differences were observed by race (x^2 = 26.84, p < .001, V = .34). White adolescents were more likely to use C+A+O and C+O than non-White adolescents whereas non-White adolescents were more likely to use CO and C+A. See Table 2 for cannabis use typologies by demographic characteristics and study variables.

Intellectual Functioning

Controlling for race, school enrollment and special education status (IEP), results of linear regression analyses revealed significant differences only for the PRI subscale of the WISC-IV, such that being in the C+A+O group compared to the CO group was associated with lower PRI scores (ß = −.22, p = .030, sr^2 = .03) , but membership in this group accounted for only 3% of the variance in PRI scores. There were no differences between C+A and CO use or C+O and CO use on PRI scores. Similarly, no differences were observed between cannabis-use typologies for PSI, VCI, or WMI scores. See Table 3 for full regression results.

Symptomology

Controlling for age, gender, and race, linear regression analyses revealed differences in internalizing, but not externalizing symptomology. For internalizing problems, being in the C+A group compared to the CO group was associated with significantly higher internalizing problems (ß = .21, p = .009, sr^2 = .03); membership in this group accounted for only 3% of the variance in internalizing symptoms. No differences were observed for externalizing symptomology.

Substance Use

The relationship between cannabis use typology and substance use problems was examined using linear regression whereas its relationship with SUD was examined using logistic regression. Controlling for demographics, family/friend risk and substance use attitudes, C+A use, C+O use, and C+A+O use was significantly associated with substance use problems relative to CO use, with these differences accounting for 2%, 4% and 4% of the variance in problems, respectively (see Table 3). Controlling for the same factors, C+A+O use was associated with increased odds of SUD diagnosis than CO use (OR = 2.85, p = .042, 95% CI: 1.04–7.85). There was no difference between C+A and CO use or C+O and CO use in odds of SUD diagnosis.

Discussion

The current study examined whether cannabis polysubstance use was related to functional or psychological problems among juvenile offenders. Our findings supported the hypothesis

that cannabis-use typologies characterized by polysubstance use (C+A+O, C+O, and C+A use) were associated with lower intellectual functioning, greater internalizing and externalizing symptomology, and greater substance-related problems among a sample of high-risk adolescent detainees. These results support recent literature that has identified polysubstance use as a risk factor for psychological problems above and beyond the risk posed by cannabis use only (15, 19), and highlights the need for screening and intervention among juvenile offenders engaged in polysubstance use.

In addition to overall risk posed by polysubstance use among justice-involved youth, we also found evidence for differential risk based on type of polysubstance use. First, regarding intellectual functioning, adolescents who used C+A+O were found to perform significantly worse on tasks of perceptual reasoning relative to those who used CO. This finding was unexpected as previous research has found that adolescents engaging in polysubstance use show poorer working memory and verbal recall than those using cannabis only, but show deficits similar to those using cannabis only in task accuracy on measures of executive functioning and visual-motor integration (which may be similar to some PRI measures) (7). One potential explanation for these results is that polysubstance use may be a proxy for heavier substance use in general, which is more consistently associated with the magnitude of intellectual or cognitive impairment, potentially above the effects of substance type (6, 41).

Second, regarding psychological distress, we found that C+A use, but not C+A+O or C+O use, was associated with higher risk for internalizing symptoms of psychological distress compared to CO use. These results contradict findings among nationally-representative adolescent samples that suggest polysubstance use confers risk for internalizing symptoms regardless of frequency (21, 42). Taken with results that C+A+O use was associated with higher risk for substance-related problems and SUD, which suggests higher risk behavior, and similar effect sizes for all groups, it is plausible that the small group sizes of C+A+O and C+O use contributed to their null relationships with psychological distress. However, it is also possible that factors contributing to differential cannabis use typologies, also contribute to varying risk for internalizing symptoms. For example, we found that family/friend risk was significantly higher among adolescents in typologies characterized by other illicit drug use than those not. It is plausible that family/friend risk drive cannabis use with other illicit drug use whereas other risk factors, such as negative affect regulation drive other cannabis use typologies, as negative affect motivations are strongly associated with cannabis and alcohol use among adolescents (43). Research with larger adolescent samples may clarify the relationship between cannabis use typologies and psychological distress among justice-involved populations. Nonetheless, the current results suggest that mental health screening may be necessary among youth reporting to detention with polysubstance use.

Third, consistent with previous studies, we found that C+A+O use was associated with greater odds of SUD diagnosis than CO use; however, contrary to our hypothesis, C+O and C+A use was not. Given that in preliminary analyses, the C+A+O group had higher rates of SUD than C+A, but not C+O, it is likely that this difference between the C+A+O and CO group was driven by the use of other illicit drugs. Prior research suggests that adolescents who use multiple substances may be more likely to use with more frequency or in greater

quantities than those who use one or two substances (44, 45), thus increasing risk for SUD. Our data provides support for this explanation, as youth who used C+A+O and C+O reported more substance-related problems than the other two groups. However, our data did not consider frequency, severity or quantity of substance use, which suggests more variability in risk that our model was unable to capture. Future studies should examine variation in psychological risk based on frequency and quantity of polysubstance use to determine whether this relationship is dose-response.

Relative to the other groups, C+A+O and C+O users also endorsed greater peer and family risk factors for substance use, which have been found to be the primary contributors to heavy cannabis and alcohol use among justice-involved youth (46). Future research should examine family and peer risk as a mechanism of the relationship between polysubstance use and SUD diagnosis among juvenile detainees, as such information would inform whether systems approaches are indicated in addition to a substance use intervention. Nonetheless, the current results suggest that detained adolescents engaging in polysubstance use may be at greater risk for SUD relative to their peers and should be a screening priority among justice-involved youth.

There are several strengths to this study, including its examination of retrospective reports of polysubstance use rather than use of a single substance, and its use of reliable diagnostic measures used by clinicians—both of which improve the study's generalizability. However, the study's limitations should be considered when interpreting its data. First, the study is cross-sectional, so we cannot make any inferences about directionality. Second, although the sample size was adequate, the relatively small and unequal group sizes may have limited power to detect effects, particularly among the smallest group—C+O. However, regardless of subsample sizes, effect sizes were small across analyses in general and relative to other studies. For example, studies examining the relationship between polysubstance use and psychological problems have found that polysubstance use explains 19–36% of the variance in intellectual functioning and internalizing symptoms (7, 21). However, these studies compared polysubstance use to non-use unlike the current study and were not conducted among justice-involved youth. These small effect sizes suggest that despite significance, cannabis use typology may not represent a pertinent covariate of cognitive and psychological problems. Third, the C+O group and C+A+O group were more likely to be White and to be detained for a drug offense. Although analyses controlled for these potential confounders, they may represent other differences between these groups of youth that were not accounted for in the current study. Fourth, results likely reflect sampling bias as the sample only included youth who were being considered for residential or prison placement, or suspicion of a mental health problem, thus representing a particularly high-risk subset of youth (i.e., more delinquency, violent behavior, and/or psychological distress). This sampling bias may be compounded by missing data on measures of intellectual functioning, which were excluded case-wise. Subsequent studies may mitigate this sampling bias by replicating findings among youth who are on probation and/or collecting data from all youth who are involved in the justice system regardless of suspicion of mental health problems. Fifth, because some of the study variables were sub-scales from the same instruments, they are likely to be correlated. However, given the limitation of power due to sample size, the correlation across variables was not accounted for within our analysis and could have

influenced results. Finally, because these psychological assessments were submitted to the court, the participants may have been felt pressure to alter their responses in order to appear more socially desirable.

Previous research has documented disproportionately high rates of cannabis and polysubstance of cannabis with other drugs use among justice-involved youth. Similar results were found in the current sample of juvenile detainees with 88% reporting past-year cannabis use and 69% of those using cannabis reporting use of alcohol, other illicit drugs, or both. The current study suggests that among justice-involved youth, cannabis polysubstance use is related to psychological problems, including SUD. Although techniques for substance use reduction are needed among justice-involved youth, those engaged in polysubstance use may have a greater need for concurrent academic, affective, and behavioral support during their transition back to the community given high rates of recidivism among those with co-occurring substance use and mental health disorders (47). Unfortunately, current research suggests that rates of treatment for SUDs and comorbid mental disorders are low among U.S. detainees, and even lower among those reporting both cannabis and alcohol use (48). The current study suggests that polysubstance use should be designated a priority for further mental health screening among detainees. It also highlights the need for accessible, evidence-based treatment approaches for substance use and comorbid psychological problems in juvenile justice settings, particularly for those engaged in polysubstance use.

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Table 1

Frequency table of arrest offenses for youth in the sample

Offense	Frequency	Proportion of Sample
Burglary, trespass, theft, robbery, etc.	117	49%
Disorderly conduct, criminal mischief, criminal recklessness, etc.	50	21%
Battery, assault, use of a weapon against another person	46	19%
Fleeing/resisting law enforcement, escape, interfering with law enforcement, etc.	43	18%
Violation of probation conditions/curfew/confinement/electronic monitoring/etc.	34	14%
Runaway, truancy, leaving home without permission	33	14%
Illegal/dangerous possession of a firearm or other weapon	22	9%
Dealing/selling or possession of illegal substance (not marijuana)	13	5%
Dealing/selling or possession of illegal substance (marijuana)	13	5%
Public consumption/intoxication of alcohol/illegal substance (not marijuana)	10	4%
Kidnapping, criminal confinement	8	3%
Driving without a license, reckless driving, etc.	5	2%
Failure to stop after an accident or personal/bodily injury	3	1%
Criminal gang activity	3	1%
Sexual battery, rape, child molestation	2	1%
Arson	2	1%
Fraud	1	0%

Note. Many youth were charged with more than one offense, so the total number of offenses does not equal the sample size.

Table 2

Comparison of demographic characteristics and variables by past-year cannabis-use typology

	***CO* 73 (30.7%)**	***C+A* 103 (45.8%)**	***C+O* 13 (5.5%)**	***C+A+O* 49 (20.6%)**	***Total* 238 (100.0%)**	**p**
Age	15.25 (1.40)	15.60 (1.22)	16.15 (.70)	15.55 (1.23)	15.51 (1.27)	.068
Male	61 (83.6%)	79 (76.7%)	12 (92.3%)	41 (83.7%)	193 (81.1%)	.413
Non-White	63[a] (87.1%)	85[a] (83.7%)	6[b] (46.2%)	26[b] (51.1%)	180 (75.6%)	**< .001**
Enrollment	50 (68.5%)	80 (77.7%)	10 (76.9%)	29 (59.2%)	169 (71.0%)	.065
IEP	19 (26.0%)	28 (26.0%)	3 (23.1%)	7 (14.3%)	57 (23.9%)	.350
Drug Offense	5[a] (6.8%)	9[ab] (9.1%)	5[c] (38.5%)	9[bc] (18.4%)	28 (11.8%)	**.004**
Intellectual Function						
VCI (n = 142)	82.23 (11.17)	79.47 (11.17)	81.83 (7.17)	83.04 (13.49)	81.09 (11.64)	.479
PRI (n = 137)	91.34 (12.00)	87.69 (11.52)	86.83 (6.71)	85.21 (17.57)	88.45 (13.05)	.254
WMI (n = 140)	91.22 (11.66)	86.78 (15.69)	85.17 (11.46)	92.16 (17.43)	89.29 (14.89)	.259
PSI (n = 140)	82.09 (11.90)	81.76 (12.49)	79.50 (8.36)	82.08 (10.78)	81.93 (11.90)	.966
Symptomatology						
Internalizing (n = 229)	56.43 (6.83)	60.24 (10.50)	58.00 (6.84)	59.09 (8.48)	58.71 (9.09)	.450
Externalizing (n = 229)	59.69 (9.55)	62.07 (11.03)	67.67 (8.26)	61.90 (10.56)	61.25 (10.47)	.425
Substance Use						
Family/friend (n = 221)	51.72[a] (11.97)	52.67[a] (11.48)	61.33[ab] (10.54)	58.24[b] (11.08)	53.90 (11.77)	**.008**
Attitudes (n = 221)	51.75 (10.51)	51.98 (11.47)	56.50 (15.03)	53.24 (8.71)	52.08 (10.73)	.813
Problems (n = 222)	52.10[a] (10.45)	57.34[b] (12.95)	68.17[bc] (12.80)	62.92[c] (11.74)	57.71 (12.86)	**< .001**
SUD	38[a] (52.1%)	67[a] (65.0%)	10[ab] (76.9%)	41[b] (83.7%)	156 (65.5%)	**.003**

Note: Sample size is indicated where *n* does not equal 238. P-values are based on omnibus tests. Among variables with significant omnibus tests, groups sharing the same superscript are not significantly different at $p < .05$.

Table 3

Linear and logistic regression results examining intellectual functioning, psychological distress, and substance problems from cannabis use typology

	PRI			VCI			WMI			PSI			Externalizing			Internalizing			Substance Problems			SUD			
	β	*p*	*sr²*	*β*	*p*	*sr²*	*β*	*p*	*sr²*	*β*	*p*	*sr²*	*β*	*p*	*sr²*	*β*	*P*	*sr²*	*β*	*p*	*sr²*	*OR*	*95% CI*		*p*
Age													−.25	*.000*	.06	−.01	.706	.00	.09	.085	.01	1.26	.99	1.61	.065
Gender													.11	.82	.01	.04	.510	.00	.03	.597	.00	.70	.32	1.55	.383
Race (non-White)	−.14	.128	.02	−.27	*.002*	.07	−.17	.055	.02	−.06	.470	.00	.07	.285	.00	.03	.540	.00	−.04	.473	.00	.63	.27	1.43	.269
Enrollment	.03	.739	.00	−.09	.312	.01	−.03	.755	.00	−.04	.631	.00													
IEP	−.14	.109	.02	−.16	.047	.02	−.27	*.002*	.07	−.21	*.014*	.04													
Family/friend risk																			.29	*<.001*	.06	1.03	1.00	1.06	.076
Attitudes																			.33	*<.001*	.08	1.04	1.00	1.07	.063
C+A (vs. CO)	−.15	.119	.02	−.13	.168	.01	−.16	.098	.02	−.02	.878	.00	.14	.056	.01	.21	*.009*	.03	.17	*<.001*	.02	1.40	.71	2.79	.332
C+O (vs. CO)	−.08	.352	.01	−.01	.872	.00	−.01	.884	.00	.02	.843	.00	.11	.107	.01	.11	.125	.01	.22	*.007*	.04	1.49	.34	6.64	.599
C+A+O (vs. CO)	−.22	*.030*	.03	−.07	.483	.00	−.03	.748	.00	−.03	.766	.00	.14	.073	.01	.13	.109	.01	.24	*<.001*	.04	2.85	1.04	7.85	*.042*

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